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QwikSeal®

Pre-Sealed Aerospace Fasteners

ASETSDefense

29 August 2012

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Report Documentation Page

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Overview

- *Qwik*Seal Background
  - Problem
  - *Qwik*Seal Solution
  - Benefits
  - Current Status
- Sealant
- Barrier Coat
- PCI
- ESTCP Program Update
  - Schedule/Tasks
  - Qualification
  - Barrier Coat Optimization
- Integration
  - Production Trials
  - Target Platforms

Problem

Current fastener "Wet-Installation" method:

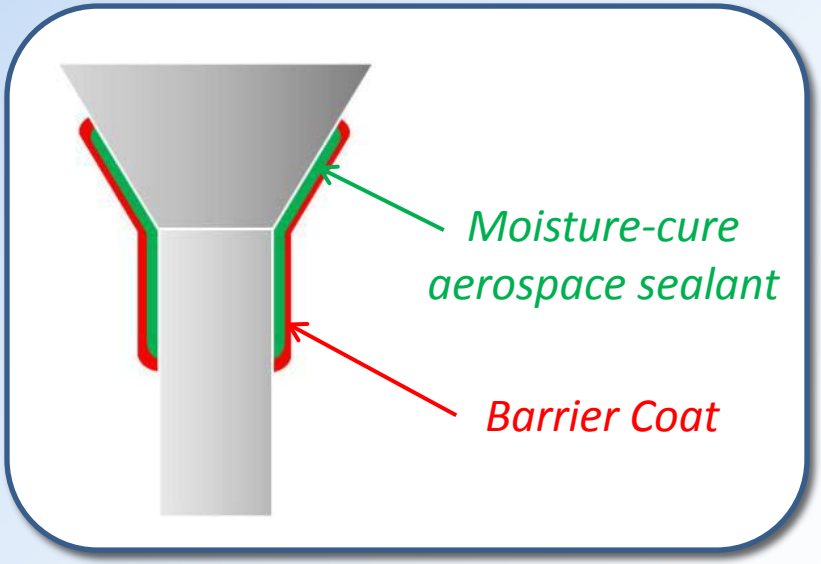
- Mix or thaw sealant
  - *Limited shelf and work life*
- Apply to each fastener
  - *Operator dependent variation*
- Install fastener
- Clean up residual sealant with solvent wipes
  - *Excessive hazmat waste disposal*

This process is messy, time-consuming, and inconsistent

The fastener sealing process must be taken out of the critical path!

*Qwik*Seal Solution

- *Qwik*Seal sealant is a moisture-curable variant of polythioether-based aerospace sealant developed by SMRC and PPG Aerospace – PRC-DeSoto
- A pre-determined amount of *Qwik*Seal sealant is applied to the fastener and quickly encapsulated with a fast-curing barrier coat
- The barrier coat excludes moisture from the system, preventing sealant cure and thus extending the shelf-life of the fastener
- Upon installation, the barrier coat ruptures exposing the sealant to ambient moisture and initiating cure



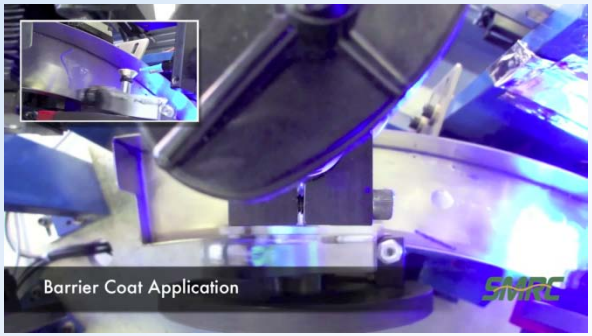
Benefits

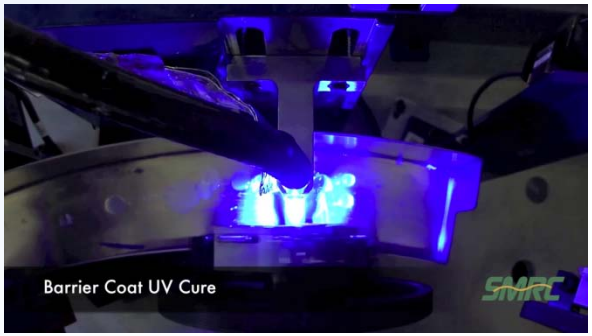
***Qwik*Seal:**

- Requires no change to fastener design or size
- Requires no change to hole size
- Requires no change to tooling
- Is applicable to a wide variety of fastener types and interference conditions
- Reduces waste
- Can be replicated in volume

Current *Qwik*Seal Status

- *Qwik*Seal cure-blocking chemistry demonstrated by SMRC
  - Sealant formulation and scale-up transitioned to PPG Aerospace – PRC-DeSoto
- Barrier coat characteristics being developed by SMRC
  - Material composition, profile, thickness, application hardware
- Premature Cure Indicator (PCI) being developed to provide a visual indication of sealant viability prior to installation (2nd generation)
- Prototype fastener production machine acquired
  - Process parameters/dispense hardware being finalized by SMRC
  - Transferring location to PPG's Valencia, CA Application Support Center (ASC) in September 2012





Automated Sealant Application

- New sealant dispense valve installed on production machine in 2011
- Capable of applying sealant to fasteners in a variety of profiles, likely to be application specific

*Qwik*Seal Barrier Coat

- Rapidly curing material encapsulates *Qwik*Seal sealant preventing moisture permeation and adding additional protection against handling
- Two barrier coat variants being developed
  - Frangible variant breaks into small pieces that mix intimately with sealant upon installation
  - Extrudable variant is removed from hole in 1-2 large pieces upon installation
- COTS as well as internally developed materials assessed
  - UV-curable and solvent-based systems being evaluated
  - New application methodology being integrated onto *Qwik*Seal production machine

Automated Barrier Coat Application

- SMRC has recently acquired a valve capable of spraying materials with a wide range of viscosities
  - Solvent based and 100% solids UV-curable materials can both be sprayed with fine control
- Bench top system constructed at SMRC to finalize barrier coat characteristics
- Valve integration onto *Qwik*Seal production machine currently underway
  - Optimized processing parameters will be transferred to *Qwik*Seal production machine.

Premature Cure Indicator (PCI)

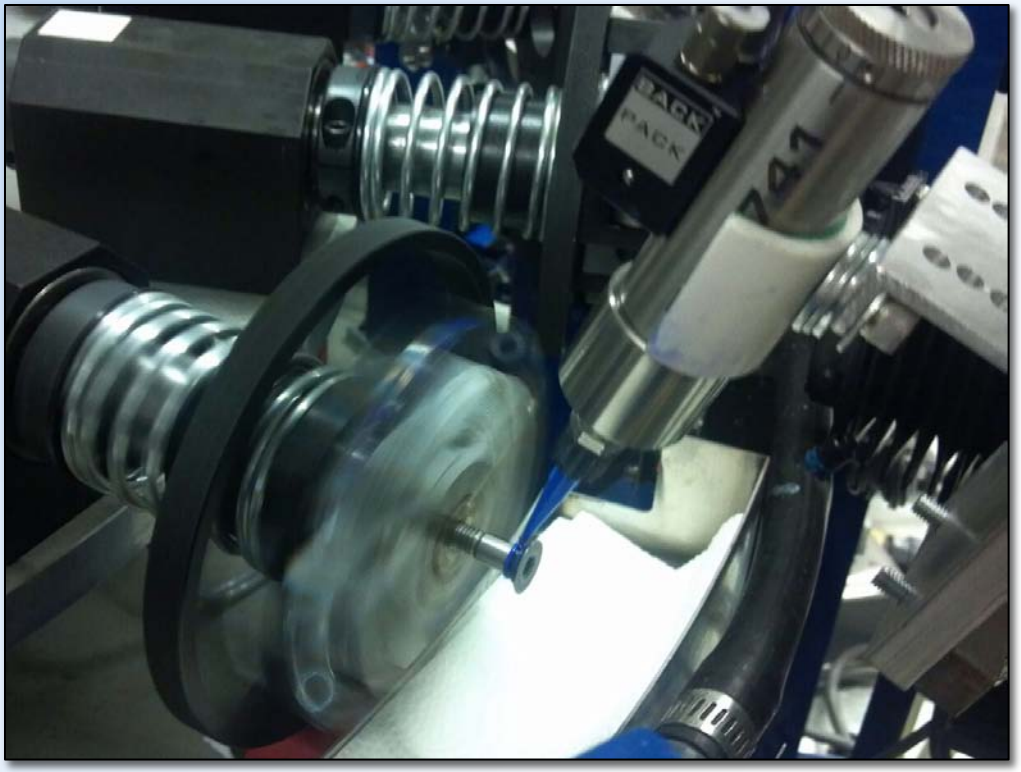
- PCI being developed under a DLA funded Phase II SBIR
- Applied in between sealant and barrier coat
- Dye reacts with activated (un-blocked) resin; changes from blue to colorless
- White base material becomes visible as reaction proceeds

t = 0 hours

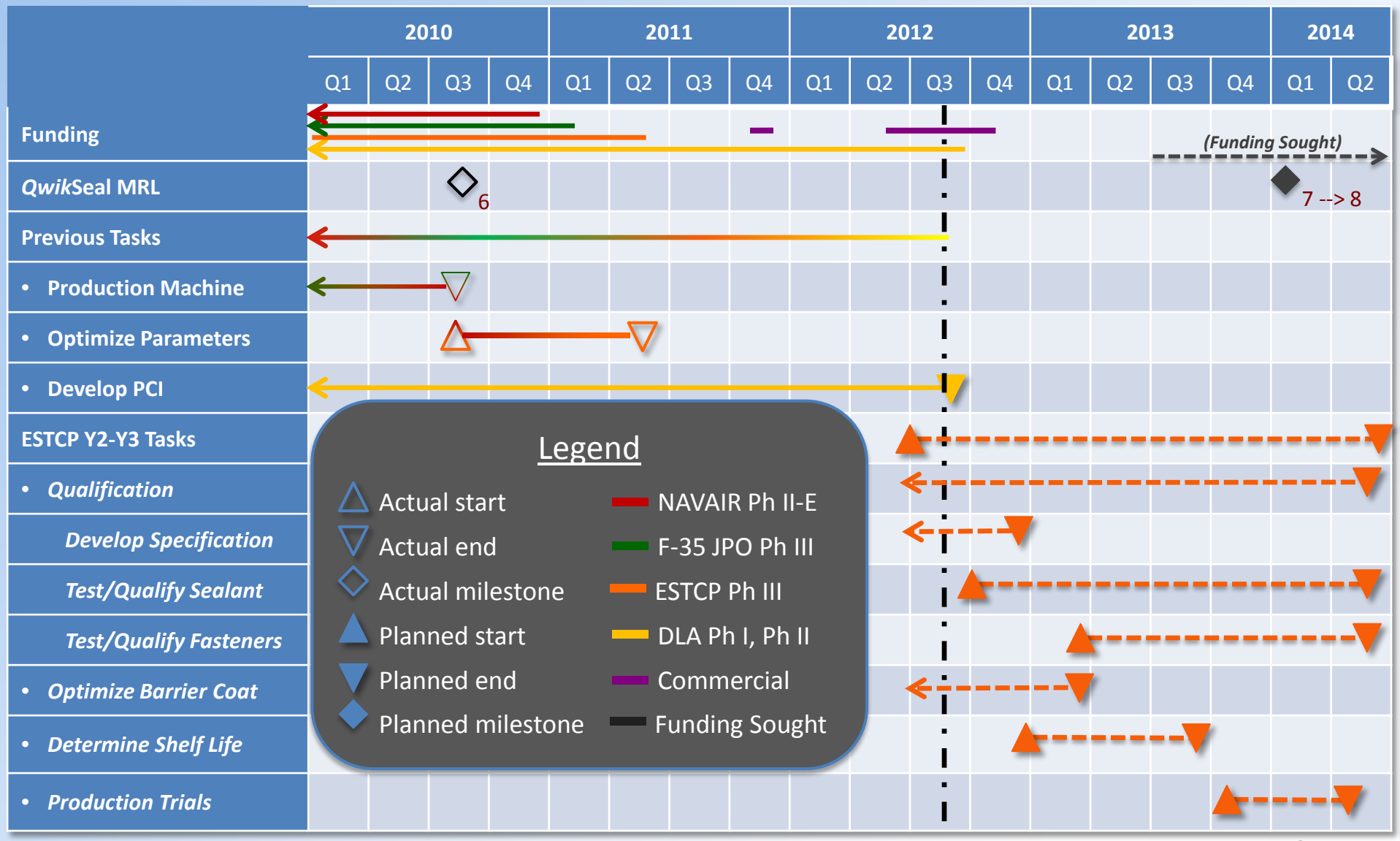
t = 72 hours

Automated PCI Application

- *Qwik*Seal with PCI is intended to be a 2nd generation product
- Dispense hardware has been identified and implementation on production machine is being assessed



ESTCP Program Overview



Qualification

- Qualification has been broken into 3 subtasks:
  - Develop specification, test/qualify sealant, qualify fasteners
- Draft specification is being developed between AFRL, NAVAIR, PPG Aerospace – PRC-DeSoto, and SMRC
  - Input from OEM's will also be sought
  - Working draft to be completed Q3 2012
- Sealant testing and qualification targeted to begin Y2Q2 of ESTCP program
  - External testing will be performed by UDRI
- Fastener testing and qualification will begin once barrier coat development has been finalized (anticipated Y2Q4)

Barrier Coat Optimization

Sealant Coverage Uniformity

Barrier Coat 1

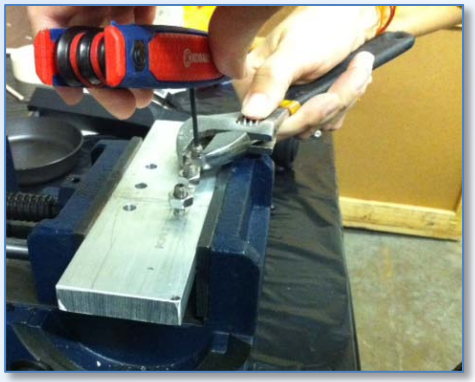
Barrier Coat 2

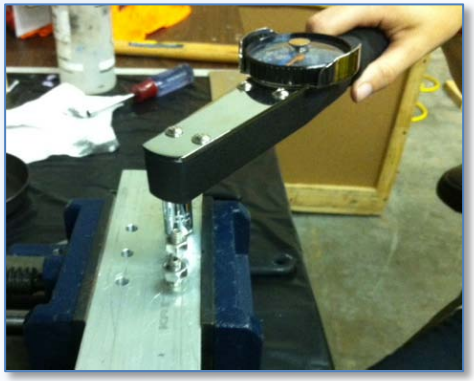
Barrier Coat Optimization

Breakaway Torque Adhesion

Test Method

- Prepare fasteners
  - Sealant only
  - Sealant with barrier coat
  - Sealant with PCI and barrier coat
- Install in countersunk panels and allow to cure for 1 week at ambient conditions
- Measure torque required to break fastener free of seal





Production Trials

- Production trials carried out with OEM's to determine possible problems before implementation
  - SMRC will work with OEM's to determine relevant test methods, fixtures, samples size, etc.
  - SMRC will provide fasteners as needed to complete testing
  - Tests performed by installers to provide feedback and identify potential issues

Target Platforms

P-3

V-22 (Bilge Area)

MQ-8

F-35
(Upper/lower wing skin, forward fuselage, mate areas)

Conclusion

Thank you for your support!

Questions & Discussions

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